

Remarks/Arguments:

I. Status of the Application and Claims

This Amendment is being filed concurrently with a Request for Continued Application, the application having been finally rejected in the Office Action mailed April 15, 2010.

Claims 4-10 have been cancelled. Claim 1 is amended herein. New claim 11 is added. As a result, claims 1-3 and 11 remain pending and under examination.

Support for the amendments to claim 1 are found throughout the application as originally filed, including the specific portions cited below (the page and line citations are to the substitute specification). No new matter has been added.

"the plurality of arms vibrating to operate": Page 4, lines 15-18, and page 5, lines 11-13.

"having a thickness smaller than 0.5 μm ": Page 11, line 18, to page 12, line 6. This paragraph states that the vibration layer has a thickness ranging from 0.5 to 10 μm and that the barrier layer should not be as thick as the vibration layer (i.e., it should have a thickness less than 0.5 μm).

"platinum": Page 4, lines 23-25, and page 7, line 21.

"containing PZT-crystal": Page 4, lines 7-10, and page 7, lines 7-9.

"wherein the barrier layer prevents Si atoms from diffusing in the platinum of the first electrode layer, the orientation control layer and the PZT-crystal of the piezoelectric layer": Page 5, lines 24-27, and page 11, lines 25-27.

Support for new claim 11 is found throughout the application as originally filed, including at page 4, line 22. No new matter has been added.

II. Claim Rejections under 35 U.S.C. § 103

A. Claims 1-4

Applicants traverse the rejection of claims 1-4 under 35 U.S.C. § 103(a) as being unpatentable over Fujii et al. (WO 2003/052840; hereinafter "the Fujii Reference") in view of Watanabe et al. (US 6153898; hereinafter "the Watanabe Reference") and Shimada et al. (US 5802686; hereinafter "the Shimada Reference"). Reconsideration and withdrawal of the rejection are respectfully requested in view of the claim amendments and arguments presented herein.

As reflected in amended claim 1, Applicants' invention is directed to an angular velocity sensor comprising:

a substrate made of single crystal silicon and having a tuning fork shape, the substrate including

a plurality of arms extending in parallel with each other, the plurality of arms vibrating to operate, and

a joint section for connecting respecting ends of the arms with each other;

a barrier layer provided on each of the plurality of arms of the substrate, the barrier layer containing silicon oxide and having a thickness smaller than 0.5 μm ;

a first adhesion layer provided on the barrier layer, the first adhesion layer containing titanium;

a first electrode layer provided on the first adhesion layer, the first electrode layer containing platinum and at least one of titanium and titanium oxide;

an orientation control layer provided on the first electrode layer;

a piezoelectric layer containing PZT-crystal provided on the orientation control layer;

a second adhesion layer provided on the piezoelectric layer; and

a second electrode layer provided on the second adhesion layer;

wherein the barrier layer prevents Si atoms from diffusing in the platinum of the first electrode layer, the orientation control layer and the PZT-crystal of the piezoelectric layer.

Applicants' claim 1 has been amended to clarify that the barrier layer has a thickness smaller than 0.5 μm yet is capable of preventing Si atoms from diffusing in the platinum of the first electrode layer, the orientation control layer and the PZT-crystal of the piezoelectric layer.

According to the Examiner, the Fujii Reference does not disclose two components of Claim 1:

1) The Examiner acknowledges that the Fujii Reference does not disclose "a barrier layer provided on each of the plurality of arms of the substrate, the barrier layer containing silicon oxide." The Watanabe Reference is relied upon to disclose this feature. This reference discloses a ferroelectric capacitor containing a "diffusion preventing" layer of silicon dioxide between a silicon substrate and a bonding layer of titanium, with a lower electrode on top of the titanium bonding layer. The Examiner argues that a skilled person would find it obvious to utilize such a silicon oxide layer in a similar location in the structure taught by the Fujii reference, for the purpose of preventing diffusion. However, the Watanabe Reference relates to ferroelectric capacitors, not angular velocity sensors. These are two unrelated technical fields. A person of ordinary skill in the art would not look to the ferroelectric capacitor field for assistance in solving a problem in the angular velocity sensor field or in improving the performance or characteristics of an angular velocity sensor.

2) The Examiner further acknowledges that the Fujii Reference does not disclose "a second adhesion layer provided on the piezoelectric layer." The Shimada Reference is relied upon to disclose this feature. This reference discloses a device in which an adhesion layer is formed between a piezoelectric layer and an upper electrode to enhance the adhesivity between these two layers. The Examiner believes it would have been obvious to similarly employ an adhesion layer between the piezoelectric and upper electrode layers in the structure described in the Fujii Reference. However, the Shimada Reference relates to printer heads for ink jet recording that are structurally very different from the angular velocity sensor claimed in the present application. For example, the Shimada Reference devices do not have a substrate having a tuning fork shape and including a plurality of arms extending in parallel with each other which vibrate in operation. These significant differences would prevent a skilled person from using the Shimada Reference to modify the structures disclosed in the Fujii Reference. In other words, such person would not find it obvious to draw upon technology related to printer

heads for ink jet recording, such as that disclosed in the Shimada Reference, when seeking to modify or enhance an angular velocity sensor of the type described in the Fujii Reference.

Additionally, an ordinarily skilled person would not have had any reason or motivation for seeking to improve or modify the substrates described in the Fujii Reference in the particular ways reflected in Applicants' claims. That is, the Fujii Reference does not suggest there are any deficiencies or problems which arise as a result of having an adhesion layer containing titanium directly in contact with a substrate made of single crystal silicon or having a piezoelectric layer containing PZT-crystal directly in contact with a second electrode layer, where such adhesion layer, substrate, piezoelectric layer and second electrode layer are components of an angular velocity sensor. What, therefore, would have led such person to introduce a barrier layer of the type recited in Applicants' claims between such adhesion layer and such substrate as well as a second adhesion layer between such piezoelectric layer and such second electrode layer? Using Applicants' disclosure as a blueprint, an ordinarily skilled person could of course recognize that it might be technically possible to place a barrier layer between an adhesion layer and a substrate made of single crystal silicon as well as a second adhesion layer between a piezoelectric layer and a second electrode layer, from the Watanabe reference and Shimada reference respectively. However, this would amount to impermissible hindsight reconstruction of the claimed invention, particularly in view of the fact that the Watanabe and Shimada References both pertain to entirely different types of devices than the angular velocity sensor of the Fujii Reference.

B. Claim 10

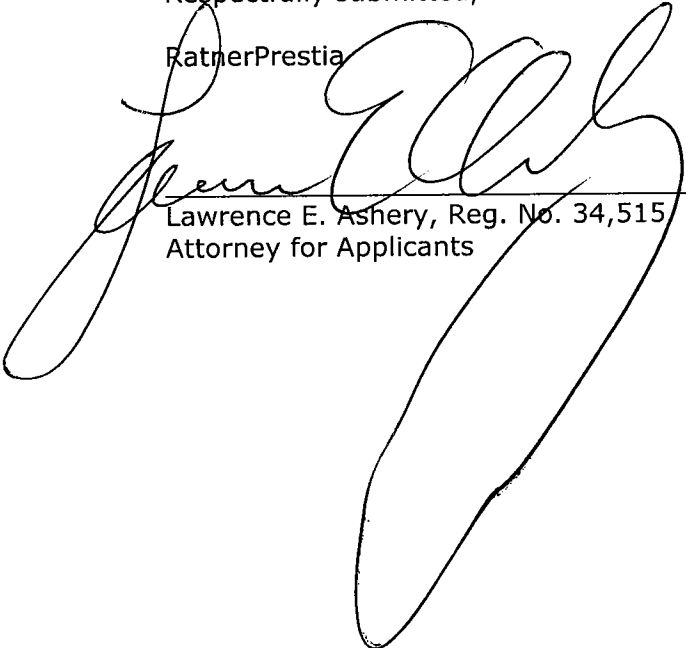
The rejection of claim 10 as obvious over the Fujii Reference in view of the Watanabe Reference, the Shimada Reference, and Nakanishi et al. (WO 2004/015370) has been rendered moot by the cancellation of claim 10.

III. Conclusion

The application is believed to be in condition for allowance. If any issues remain, the Examiner is invited to contact Applicants' legal representative at the telephone number listed below so that such issues may be discussed and resolved.

Respectfully submitted,

RatnerPrestia



Lawrence E. Ashery, Reg. No. 34,515
Attorney for Applicants

SDH/sh

Dated: June 15, 2010

P.O. Box 980
Valley Forge, PA 19482
(610) 407-0700

889785